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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/642,951	08/18/2003	Richard E. Fontaine	09991-042001	4153
26161	7590	04/15/2005	EXAMINER	
FISH & RICHARDSON PC 225 FRANKLIN ST BOSTON, MA 02110			NGUYEN, LAM S	
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			2853	

DATE MAILED: 04/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/642,951	<b>Applicant(s)</b> FONTAINE ET AL.	
	<b>Examiner</b> LAM S. NGUYEN	<b>Art Unit</b> 2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |  |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>10/25/2004</u> . | 6) <input type="checkbox"/> Other: ____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 28 recites the limitation "pumping chambers" in line 3. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-5, 7, 8, 10-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Murakami et al. (US 4563689).

**Referring to claims 1, 13, 27:**

Murakami et al. discloses an apparatus that is an ink jet print head (*column 4, lines 2-5*) comprising

a plurality of droplet ejection devices, each said droplet ejection device including  
a fluid chamber (*FIG. 1a, element 3*) having a volume and an ejection  
nozzle (*FIG. 1a, element 1*),  
an electrically actuated displacement device (*FIG. 1a, element 7 and FIG.*

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*11b, element 8)* that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance associated with the electrically actuated displacement device changes in charge between an actuated condition and an unactuated condition (*column 4, line 67 to column 5, line 8: A voltage applied to both plates of a piezoelectric becomes a voltage waveform similar to the charge and discharge characteristics of a capacitor*), and

a first switch (*FIG. 10b, elements Tr3, Tr4*) that has a first input connected to an electric source terminal (*FIG. 1a, element +V3*), a first output connected to said electrically actuated displacement device (*FIG. 10b, element 8*), and a first control signal input (*FIG. 10b, element INPUT B*) to determine whether said first input is connected to or disconnected from said first output, and

an electric source that is connected to distribute an electrical signal to said first inputs of said plurality of droplet ejection devices (*FIG. 10b, element +V3*), and

a controller that provides respective charge control signals to respective said first control signal inputs to control the extent of change in charge on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIG. 10b: The corresponding unit that outputs INPUT B and INPUT A signals such as TIMER(4) in FIG. 12*)).

**Referring to claim 2:** wherein said electrically actuated displacement device moves between a displaced position and an undisplaced position as a capacitance associated with the electrically actuated displacement device changes between a charged, actuated condition and an uncharged, unactuated condition (*column 4, line 67 to column 5, line 8: A voltage applied to both*

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*plates of a piezoelectric becomes a voltage waveform similar to the charge and discharge characteristics of a capacitor), and wherein said controller that provides respective charge control signals to respective said first control signal inputs to control the extent of charge placed on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (FIG. 11a-b).*

**Referring to claims 3, 15:** wherein each said droplet ejection device also includes a second switch (*FIG. 10b, elements Tr5, Tr6*) that has a second input connected to a discharging electrical terminal (*FIG. 10b, element -V4*), a second output connected to said electrically actuated displacement device (*FIG. 10b, element 8*), and a second control signal input (*FIG. 10b, element INPUT A*) to determine whether said second input is connected to or disconnected from said second output, and wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of the charge on said respective capacitances.

**Referring to claim 4:** wherein each said droplet ejection device comprises a first resistance between said electric source and said electrically actuated displacement device (*FIG. 10b, element VR: The resistor VR connects the electric source +V3 to the piezoelectric 8 during a charge period*).

**Referring to claim 5:** wherein each said droplet ejection device comprises a second resistance between said discharging electrical terminal and said electrically actuated displacement device (*FIG. 10b, element VR: The resistor VR connects the discharge electric source -V4 to the piezoelectric 8 during a discharge period*).

**Referring to claim 7:** wherein a single resistance is used to charge and discharge a respective capacitance (*FIG. 10b, element VR*).

**Referring to claim 8:** wherein a plurality of resistors, voltages and switches are connected to each said electrically actuated displacement device and controlled by said controller to change the charge on said capacitance (*FIG. 10b*).

**Referring to claims 10-12:** wherein said electrical signal is a controlled voltage signal, a controlled current signal, or a constant current (*FIG. 10b, INPUT A and B*).

**Referring to claim 14:** wherein said first control signal terminates the connection of said constant voltage to said electrically actuated displacement device when the charge on said electrically actuated displacement device is at a predetermined value which is less than said constant voltage (*FIG. 10b and FIG. 11a-b: Since the amplitude of signal M is equal to the subtraction of  $+V_3$  to the sum of  $V_{CE}$  of  $Tr_3$  and  $V_{VR}$ , the amplitude of signal M is less than  $V_3$* ).

**Referring to claim 16:** wherein electrically actuated displacement device is a piezoelectric actuator (*column 4, line 67 to column 5, line 8: A voltage applied to both plates of a piezoelectric becomes a voltage waveform similar to the charge and discharge characteristics of a capacitor*).

**Referring to claims 17-19:** wherein said first control signals are controlled to provide uniform droplet volumes or velocities from said plurality of droplet ejection devices or to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide pay scale control (*column 3, lines 65-68: Since the ink droplet size can be freely changed, the drop volumes can be controlled to be uniform or at predetermined value*).

**Referring to claim 20:** wherein said first and second control signals are controlled to connect said electrical signal to respective said electrically actuated displacement devices for respective predetermined times (*FIG. 9a-b*).

**Referring to claim 21:** wherein respective said first control signals are controlled to connect said electrical signal to respective said electrically actuated displacement devices until respective said electrically actuated displacement devices achieve respective predetermined charge voltages (*FIG. 11a-b*).

**Referring to claims 22-23:** wherein said first control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device (*column 4, lines 13-17: Said preceding pulse not having enough energy for the ink to be ejected from the nozzle*).

**Referring to claims 24-25:** wherein said first control signals are controlled to inject noise into images being printed so as to break up possible print patterns and banding (*column 2, lines 37-40: The noise is the satellite droplets*).

**Referring to claim 26:** wherein said first and second control signals are controlled to vary the amplitude of charge as well as the length of time of charge on said electrically actuated displacement device for the first droplet out of a droplet ejection device so as to match subsequent droplets (*column 6, lines 20-25: Changing the pulse height and width of the pulse*).

**Referring to claim 28:** wherein said controller includes a field programmable gate array on a circuit board mounted to a monolithic body in which said pumping chambers are formed (*FIG. 12*).

**Referring to claim 29:** wherein said controller controls said first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency (*column 6, lines 20-25*).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 4563689) in view of Nakano et al. (US 5359350).

Murakami et al. discloses the claimed invention as discussed above except wherein each said droplet ejection device has a first resistance that is between said electrical source and said electrically actuated displacement device and is external of an electrical path from said electrically actuated displacement device to said second switch, and further comprising a second resistance that is included in the electrical path from said electrically actuated device to said discharging electrical terminal and wherein said discharging electrical terminal is at ground.

Nakano et al. discloses a driving circuit for an ink jet printing head including a first resistance (*Fig. 7A, element 29*) that is between an electrical source (*Fig. 7A, element 33: The resistor 29 is connected to the voltage source 33 during the charge period in which the switch 31 is on*) and an electrically actuated displacement device (*Fig. 7A, element 34*) and is external of an electrical path from said electrically actuated displacement device to a second switch (*Fig. 7A, element 39*), and further comprising a second resistance (*Fig. 7A, element 30*) that is included in

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the electrical path from said electrically actuated device (*Fig. 7A, element 34*) to a discharging electrical terminal that is at ground (*Fig. 7A: During the discharge period, the discharge current from the piezoelectric 34 goes through resistor 30 and transistor 32 to ground*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the driving circuit disclosed by Murakami et al. such as including the first and second resistance as disclosed by Nakano et al. The motivation for doing so would have been to be able to adjust the discharging time and the charging time of the piezoelectric element by changing the value of the resistors 30 and 29 as taught by Nakano et al. (column 9, lines 20-24).

#### ***CONTACT INFORMATION***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LN  
04/07/05



HAI PHAM  
PRIMARY EXAMINER